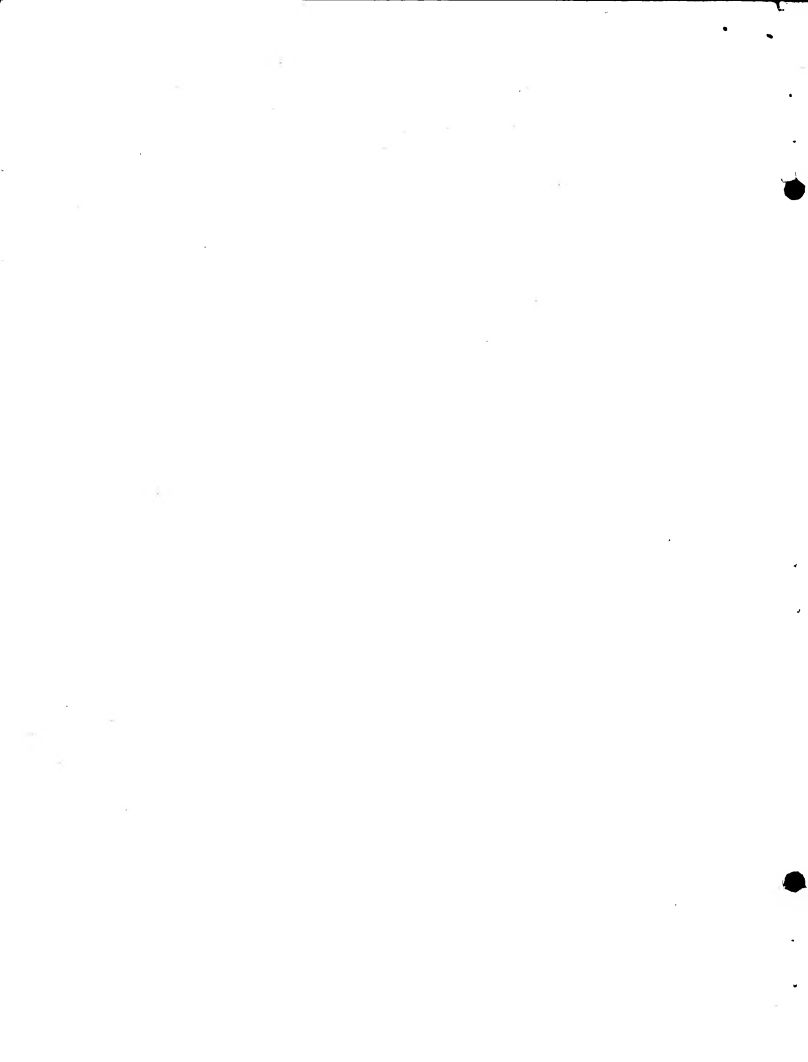


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PREFACE

The development of population fertility statistics and mortality rates in the Bureau has made this bulletin possible. It deals with a subject of great scientific and popular interest, viz., the future size of Canada's population. While the bulletin does provide some estimates relating to the period up to 1971 it does not attempt to predict what Canada's population actually will be towards the end of this century. The estimates given are based on assumptions which completely disregard the influence of factors which may be important determinants of the actual population of the future.

Numerous cautions are incorporated in the text to prevent misunderstanding of the figures. It should be clearly understood that these projections of population size for Canada to 1971 are based on definite assumptions which are clearly stated. No allowance is made for offsetting factors such as migration, war, etc. It is assumed in them that both mortality and fertility rates in Canada will continue to fall and that they will follow a pattern indicated by recent trends. Paragraph 2 (page 1) of the bulletin makes clear how the estimates are valid only if the assumptions on which they are based prove to be the future pattern of events. If, for example, Canada were to have a large immigrant movement or if, due to some unforeseen development, fertility trends should change, such factors would exert influences not included in the assumptions on which the estimates are based and would produce different results.

Possible changes through internal migration require that provincial and regional data be used with special caution and that constant reference be made to the assumptions on which they are based.

This study is the work of Dr. Enid Charles, Mr. Keyfitz and Mr. Roseborough. Acknowledgments are due to Dr. O. A. Lemieux and Mr. A. H. LeNeveu for advice. Miss P. F. E. Chrysler, Miss L. M. Podham and Miss P. Whelan did the computations and Mr. J. W. Delisle drew the charts. Acknowledgments are also due to the League of Nations for permission to reproduce charts from "The Future Population of Europe and the Soviet Union".

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Population: F-4

THE FUTURE POPULATION OF CANADA

PART I. TEXT

1. INTRODUCTION

In the past 50 years, the problem of population size has assumed a position of considerable significance. This interest has resulted in an intensive study of past trends of fertility and mortality rates of all countries and an attempt, on the basis of past experience, to project particular populations 30 - 50 years into the future. The value of population projections lies, not in their prophetic qualities, for it cannot be too strongly emphasized that no attempt is made to predict what the total population of a community will be at some future date, but in their examination of what consequences must ensue if no unforeseen agencies intervene to affect drastically past trends. From this examination, it is possible to suggest the general factors which must be taken into account before any attempts be made to change the size of the population - either through migration or by alteration of birth or death rates. At the same time, the projections of past trends are valuable in that they suggest possible population changes which will affect legislation in the fields of housing, educational policy and pensions. Strictly speaking then, the population processes to be studied here are useful mainly as a frame of reference within which population problems may be studied profitably.

Accordingly no attempt is made to predict future events, nor is there any attempt to assess the importance of all past events. Wars, migration, epidemics, famines, depressions, affect the orderly sequence of events, but an accurate prediction of the effects of such phenomena in the future is impossible. Because of this we consider only those processes of population change which on the basis of past experience are likely to continue regardless of the pressure of more dramatic developments. The processes of change here described stem from very definite assumptions made on the basis of past events, and upon an orderliness of events unaffected by crises. Accordingly the results are true only under these assumptions, and they have predictive value only to the extent that the assumptions are valid.

Computations were made not within the scope of one set of assumptions only, but upon different assumptions which may reasonably be taken to circumscribe the likely course of events. In this way, it was thought possible to assign certain limits within which the population will probably lie unless unforeseen agencies are brought to bear upon its maintenance or unless active steps are taken to avoid the consequence of present conditions.

The most usually acceptable way of making population projections is to take the nearest accurately known population and to apply to each age group a given set of fertility and mortality rates. These can be selected in two ways. We can use the fertility and mortality rates of the time at which the projection is made, or we can assume that these rates change in the future in a way which is logically related to their past history. The first of these ways gives a dramatic picture of the effects of current fertility and mortality on population growth, but it is unlikely that such estimates will correspond at all closely to actual future populations, since modern history affords us no example of such stability over any lengthy period. The history of all countries of which we have statistical knowledge is one of continuous decline in both fertility and mortality over the past 100 years with slight temporary fluctuations.

Though uniform Dominion-wide statistics are of very recent date in Canada, there is sufficient evidence to indicate that our history conforms to the general pattern. The trend in fertility before the period covered by vital statistics is discussed in Census Bulletin F-1. The trend between 1921 and 1939 is shown in Figs. 13 & 14. Our knowledge of changes in mortality is even scantier, but what little we know of mortality conditions in earlier years and the changes between 1931 and 1941^x indicate that the improvement in mortality has followed much the same course as elsewhere. Hence all the estimates to be presented are made in the second of the two ways described above, i.e., they all assume that both fertility and mortality rates will continue to decline in some way.

The projections of the present study show the population of Canada from 1940 to 1971, not as it will be but as it would be under two sets of assumptions. Four estimates have been computed: Estimates A and B are based on one set of assumptions, Estimates C and D on the other. Both sets have one assumption in common - that no migration takes place over the Canadian border or between provinces during the period. This is necessary because past experience gives no basis for assuming any consistent trends. The rapid influx of population to Canada ceased before the first World War and was followed by a period of loss to the United States and some gain from Europe. Unless some new development occurs which would lead to a reversal of present immigration policies, it does not seem likely that external migration will greatly affect the future size of the population.

With respect to vital rates, the assumptions for the estimates diverge. For Estimates A and B the method devised by F. W. Notestein and colleagues for projection of European populations was used.^{xx} Estimate A is the result of the application of the hyperbolic curves drawn by Dr. Notestein for Europe to Canadian fertility and mortality rates. The assumption made is that both mortality and fertility in Canada will fall and that their fall will be at the rate shown by the various countries of Europe when they were at the levels at which we now stand. Canadian experience over the past twenty years shows a moderately close correspondence with the rates of fall derived from European data. The mortality rates between 1921 and 1941 fell somewhat faster than Notestein's curves would indicate while the fertility rate fell somewhat slower. Because of this, the rates used are different from those

^x Census Monograph No. 13, Canadian Life Tables, 1931; Canadian Life Tables, 1941; Bulletin F-1.

^{xx} "The Future Population of Europe and the Soviet Union" (League of Nations, Geneva, 1944), ch. 1 and appendix I.

which would have been predicted on the basis of Canadian experience alone with the result that the population projected in Estimate A may be considered a minimum limit. The justification for such a projection lies in the fact that it makes possible a comparison of Canadian results with those which Dr. Notestein shows for European countries. In Estimate B the same process is applied to each province individually. The Canadian total of Estimate B differs from that of Estimate A in that it is a total of the results of provincial projections. This gives a slightly higher total population than that obtained by treating Canada as a unit.

In Estimates C and D the same assumptions are made about mortality as in Estimates A and B, since the difference between Canadian and European experience was slight over all age groups taken together and would have little effect on total population size. Future fertility rates in these assumptions were based solely on Canadian experience from 1931 to 1939. Since this was a period of rapid decline in fertility, the projection of fertility for Canada as a whole is identical with that obtained from Estimate A but there are considerable differences in provincial rates of fall. However, a second difference in assumptions results in a larger future population in Estimates C and D. The Notestein projections ignored the effect of World War II on demographic trends. The course of Canadian vital trends in wartime^x makes it probable that this procedure would under estimate the numbers of future births. Hence we have assumed that fertility rates will decline from their wartime peak until they reach the 1939 level in about 1946. Thereafter, they will decline in the manner just described. According to Estimates C and D, therefore, the effect of World War II in Canada would be a net gain in births.^{xx}

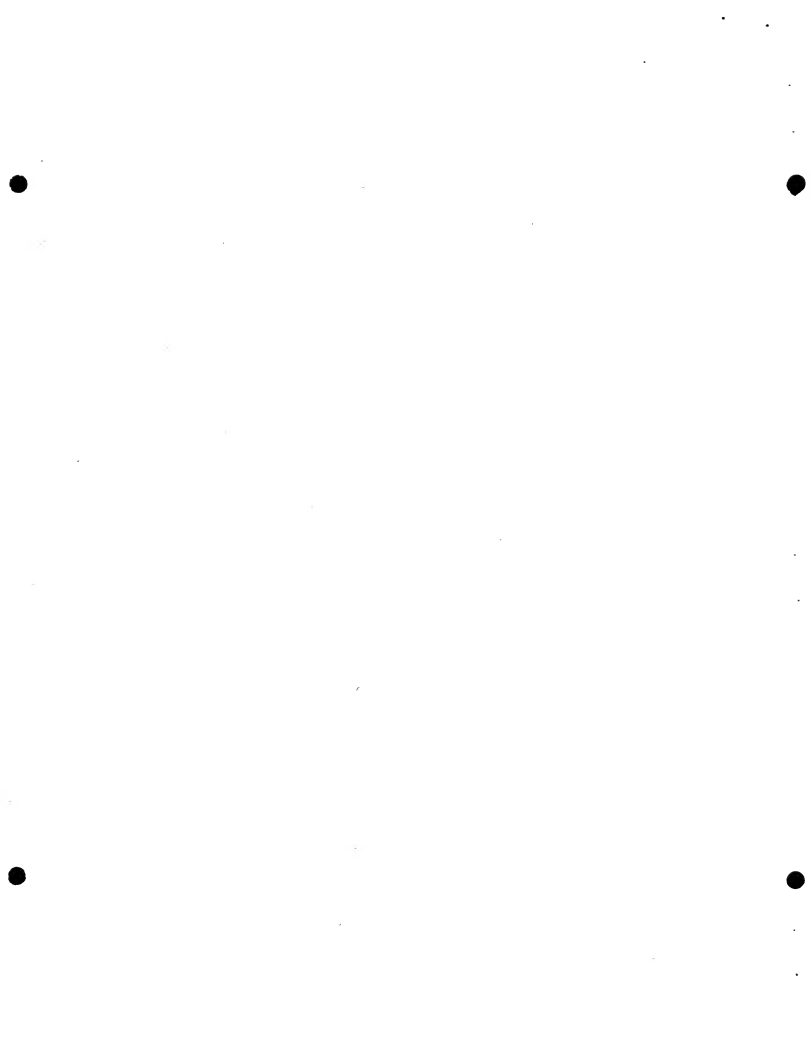
At the same time, Estimates C and D consider the effects of internal migration trends during the war period because in both the projection is based on the estimated population of June 1, 1944. Whether the post-war period will see a shift in internal migration would be difficult to predict. An analysis of the trend since 1921 with its emphasis on rural-urban migration would appear to be basic, in spite of the opening up of the Prairies and some backing up on the land during the depression. Since 1921, five provinces have shown consistent movements, - into Ontario and British Columbia and out of Prince Edward Island, New Brunswick and Manitoba. Saskatchewan gained somewhat in the 1921-31 period and lost heavily thereafter. It would appear that the urban future of Ontario and British Columbia is firmly established and that some movement in that direction will continue from Prince Edward Island, New Brunswick, Manitoba and Saskatchewan. Since some recession from the 1944 level may be expected, our estimates should give relative provincial size fairly well in the near future, but thereafter internal population movements may change the picture materially.

Provided the assumptions of a continuance of secular trends in fertility and mortality agree with future experience, these estimates provide limits to the probable future population of Canada. Estimates A and B, as has been said, show a lower limit; Estimates C and D show an upper limit. Details of the assumptions made will be set forth in the next section.

Population figures for Estimates A, B and D are given in Basic Tables 1, 2 and 3. Estimate C will only be referred to incidentally since it adds little in-

^x Charles "Canadian Vital Statistics During the War Years", Can. Journ. Pub. Health, November, 1944.

^{xx} For a more detailed account see Appendix.



formation of value. We recommend that readers who wish to use a figure for future populations without going into methodological details or forming their own judgment of the relative probability of the different estimates, should use the figures of Estimate D. Populations for years and age groups not shown in the table can be obtained by simple interpolation. Sections 2, 3, and 4 give a brief description of the results and the main features are summarized in Section 5. Technical details of the methods used will be found in the appendix.

The following points should be borne in mind when reading the tables:

(a) No internal or external migration is assumed in Estimates A and B after 1941, and in Estimate D after 1944.

(b) All populations are overestimated by the amount of military deaths after June, 1941. These were not known completely at the time the estimates were made. They are of the order of 35,000.

(c) Estimate A relates to all Canada, Estimates B and D to the nine provinces, excluding Yukon and the Northwest Territories.

(d) In Estimate A the populations are of January of the given year. In Estimates B and D the populations are of June of the given year.

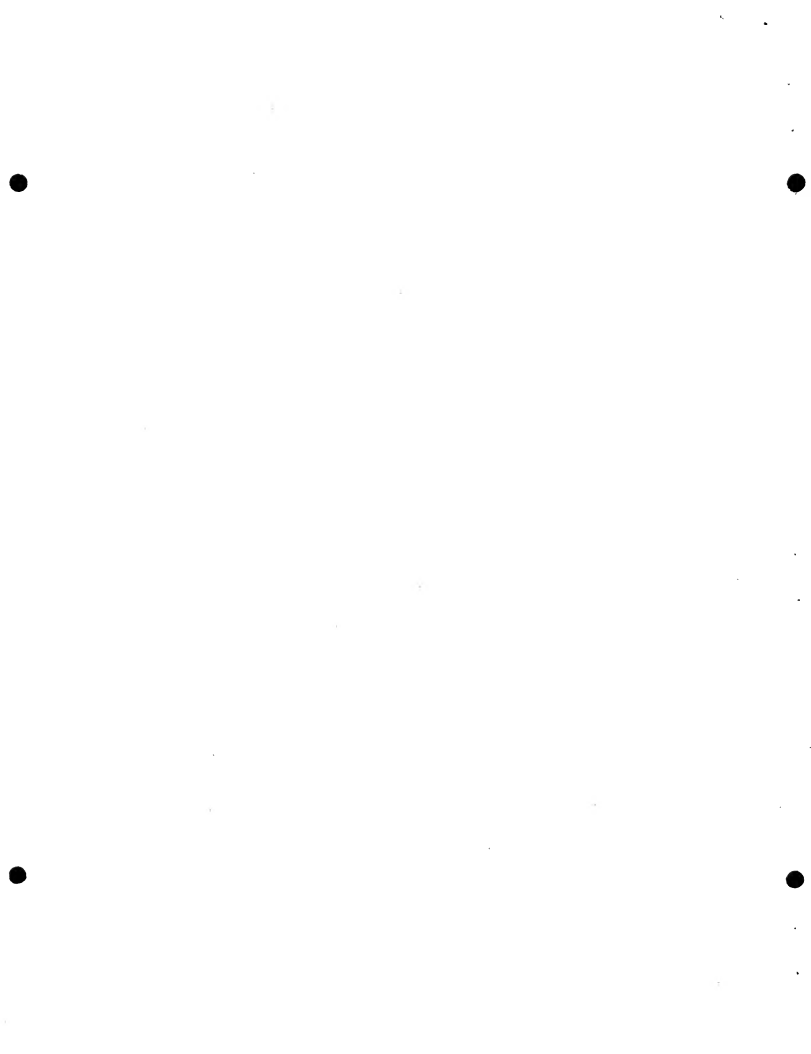
(e) Estimate A is based on the official Census population. Hence the age-group 0-4 years in 1941 is underestimated throughout.

(f) Estimates A and B are made on similar assumptions, the difference between them being due to the fact that Canada as a whole is the unit in the former, and the individual provinces are the units in the latter. Estimate D is based on a different set of assumptions.

(g) In Estimates A and B the base year is 1941. Hence the age structure of the estimated population of 1940 does not correspond precisely to that of subsequent populations. Similarly in Estimate D the base year is 1944, and so the age-structure of the 1941 population does not correspond precisely to that of later years.

Since so much misconception exists as to the predictive value of population projections, it may be well to reiterate some of the main points involved. Population projections are in the first instance solely statements of the results of current trends in fertility and mortality. As such they are useful as a guide to public policy and it is irrelevant whether or not they agree with the actual population of the future. Administrators and citizens are, however, not content to stop at this point but require to know what is the most probable estimate of the future population. To answer this judgment is required to decide in what way future events are likely to modify the operation of past trends. The difficulty is well illustrated by the difference in the numbers of births postulated in our two sets of estimates. Though, as far as we know, nothing has occurred to reverse the trend towards smaller families, temporary fluctuations of great magnitude in the number of births are seen in response to short-term changes in economic conditions. The smaller the family gets, the more pronounced are these fluctuations, since first and second births form an increasing proportion of the total and these follow pretty closely the marriage rate, which in turn follows the trade cycle. Consequently, predicting the most probable number of births, even a year ahead, involves predicting, among other things, the amount of unemployment.

In spite of the difficulties, the statistician cannot escape the responsibility of contributing his judgment as to the probable future course of population. Though as liable to error as that of any other citizen, his opinion may be somewhat more well-informed. It is the opinion of the authors of this report that, in the absence of any migration movements, either internal or external, and with allowance for military deaths which have not been included, the most probable future population of Canada will lie between the upper and lower limits of the estimates shown, and most probably nearer the upper limit.



2. RESULTS

(i) Canada as a whole

The population of Canada began to increase rapidly after 1900 with the impetus given it by European migration. After 1931, with the restrictions placed upon immigration, the population has continued to grow, but at a rate which is becoming progressively smaller. Thus the decennial rate of increase which was 34 p.c. and 22 p.c. in the expanding period 1901-1921 was less than 11 p.c. in the last census period 1931-1941.^x Estimate B assumes the same rate of increase in 1941-51 and Estimate D a slightly higher rate, but with both the assumed trends in fertility and mortality the rate of increase will continue to decline and the population will reach a maximum by the end of the century. Thereafter it will decline slowly. On the bases of Estimate C, assuming fertility and mortality remain unchanged after 1970, the population would reach its maximum of 15 million around 1990.

The total populations according to Estimates B and D are shown in Fig. 1. When war-time trends are taken into account, Estimate D shows a continued upward trend of numbers which should reach an upper limit in the last decade of the century. Estimate B, on the other hand, shows an upward trend that begins to flatten out rather perceptibly after 1961. The increase of population will continue to become progressively smaller in the near future even without any further decline in fertility, for the population is aging as a result of declining fertility in the past and this means more deaths and fewer births. Fig. 2 illustrates the change in age structure of the population between 1941 and 1971 for Estimate B. Estimate D would show an age structure similar in the older ages but with larger numbers in the ages 0-29. Both show a decrease in the number of births and children to age 14. In spite of a favourable age structure, a continuation of past trends would lead to a net reproduction rate falling below unity about 1950 to 1955, and hence to an ultimately declining population. This suggests that social action directed to stabilizing family size at a level adequate for a stationary or moderately increasing population would have more chance of success in the next ten to fifteen years than at a later period when fertility rates may have fallen below the desired level.

(ii) Provinces and Regions

The rate of increase in numbers for Canada as a whole does not represent the trend in the provinces separately. Differences in economic and cultural conditions influence birth and death rates and the resultant populations vary in size and age structure. The proximity of the frontier period in Canadian history has affected the trends in population for the various provinces. Nevertheless, by 1941 the decennial increase was fairly similar for all.^{xx} In the older regions, growth since 1901 has been reasonably consistent although the Maritime region has fluctuated considerably. Before 1931, Prince Edward Island shows an undulatory trend with a decrease in population which reached its largest amount between 1901 and 1911. Nova Scotia shows a growth which became progressively smaller until 1901, and then rose in the subsequent two decades. In the 1921-31 period it shows a loss. The New

^x The Canada Year Book 1943-44 (Ottawa, 1944) p. 78.

^{xx} Vide Canada Year Book 1943-44. Ch. IV, Section 1.

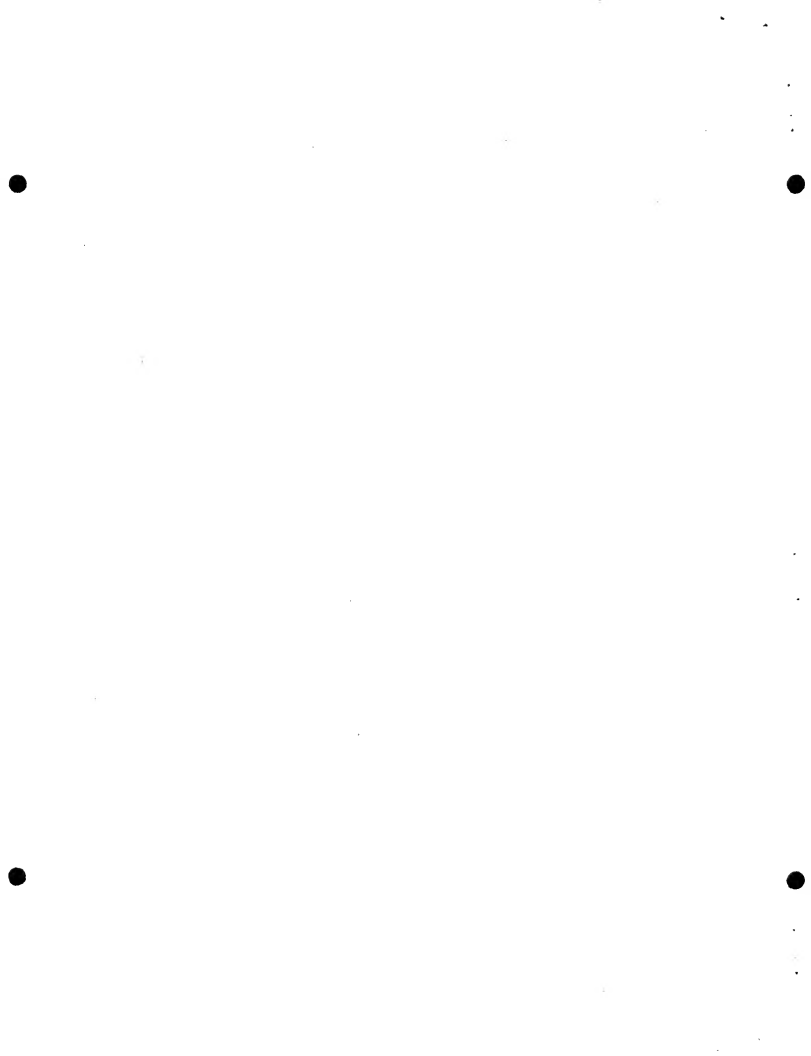
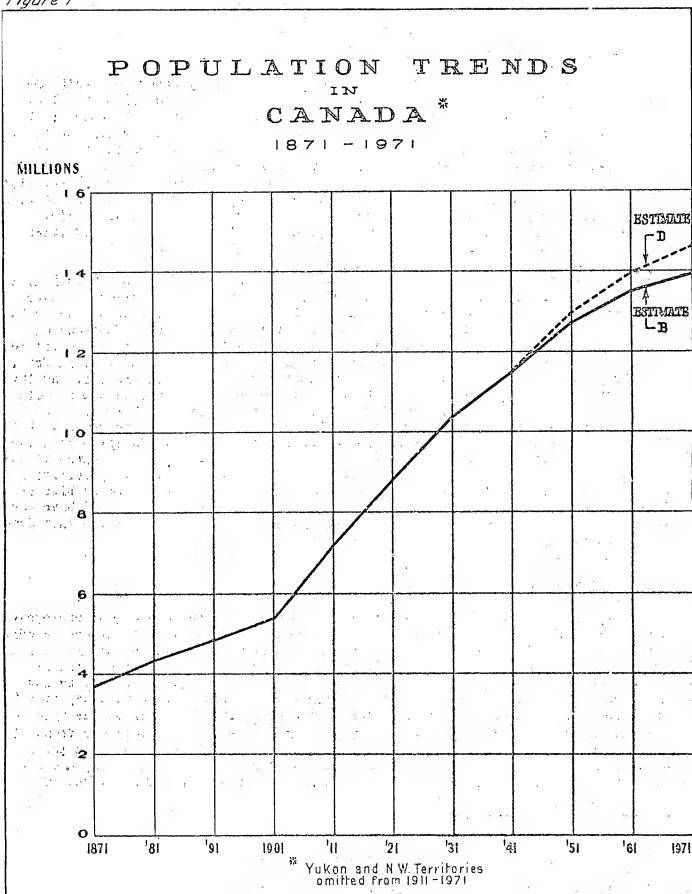


Figure 1



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